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AND
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A RECORD OF PROGRESS IN ARTS, INDUSTRY, AND MANUFACTURES,
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CONTENTS.

PAGE.
ADVERTISEMENTS 170
APPLICATIONS FOR LETTERS PATENT 170
CROWN RIGHTS AND INVENTORS' CLAIMS 171
SUBSTITUTE FOR CANTHARIDES 172

REVIEWS—

Promotion of Scientific Industry 172
Protestantism 172
Contagious Diseases Acts 172
Educational Endowments 173
Spiritual Telegraphy 173
Wood's Insects Abroad 173
Polarization of Light 174
Literary Announcements 174
PAGE.
EXTERNAL SCREW CUTTER FOR BOTTLE NECKS 175
THE NAGPUR WATER WORKS 175
RICHARD'S MONEY-TAKING REGISTERING APPARATUS 175
PROMOTION OF INFECTIOUS DISEASE BY SCHOOL BOARD ACTION 176
OPENING OF SESSION OF INVENTORS' INSTITUTE 176
PROCEEDINGS OF THE INVENTORS' INSTITUTE 177
MONTHLY NOTICES 177

PROCEEDINGS OF SOCIETIES—

Royal Institution 178
PAGE.

Societies Continued—

Society of Biblical Archæology 178
Geographical Society 178
Geological Society 178
Entomological Society 178
Chemical Society 178
Microscopical Society 178
Institution of Civil Engineers 178
Mathematical Society 178
Anthropological Society 178
Zoological Society 178
SYNTHETIC DIVISION OF ARITHMETIC 179
SOME MORE SCHOOL BOARD DOINGS 180

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(*To be continued on page* 180)

SCIENTIFIC REVIEW
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DECEMBER 1, 1874.

CROWN RIGHTS AND INVENTORS' CLAIMS.

The case of *Feather* v. *the Queen,* which was decided some few years ago, caused a great stir amongst all those inventors whose ingenuity developes itself in improvements serviceable to the Government of the country. Not that there ought to have been any surprise if the question raised in that case had been properly examined into, for on no principle could it be supposed that the Crown could be legally bound not to use an invention (perhaps one that might be the salvation of the State), without paying the inventor just what he might please to ask, and especially if it be borne in mind that many years ago the case of Perring's Anchor Patent was before the Courts in regard to the question as to whether, when a patentee had supplied articles to the Government in pursuance of the proviso in the patent that he should supply same "at such times and on such reasonable prices" as, by the proper officers of the Government, should be settled," and it was decided (vide Adolphus and Ellis' Reports, p. 949), that no *mandamus* could be issued to compel the Government to carry out this proviso. It is true, Perring's case did not settle the whole matter, consequently there was room for raising the question whether in any way the Crown was bound to respect its own patent grant as applicable to itself, or was compellable to pay an inventor for the use of his invention by itself. *Clare* v. *the Queen,* and the above-mentioned case of *Feather* v. *the Queen,* seemed to dispose of this question altogether in favour of the Crown. However, recently, Mr. Lyall Thomas has brought forward the case in a new form by means of a Petition of Right on an alleged contract by the War Office with him to pay him remuneration for the use of his drawings and designs for heavy rifled ordnance. The late Attorney-General, Sir Henry James, demurred to the claim on the ground that a petition of right does not lie on a contract, nor on any other claim than for the restoration of lands or return of specific goods retained by the officers of the Crown, and as appears by the report of Queen's Bench proceedings in the *Times,* Nov. 21st inst., the case was argued last Term by Mr. W. Williams, on behalf of the petitioner; and Sir R. Baggallay, the Attorney-General, on behalf of the Crown; and as the Petition of Right Act expressly declared that it should not extend the law, the issue of the argument turned chiefly on ancient law, although it was stated by Mr. Justice Archibald (who drew the Act) that certainly an impression had ever since prevailed that petition of right was available in respect of debts or contracts by the Crown, and that many such petitions had been brought, and we have ourselves reported several such cases. At the close of the argument, the Court took time to consider their judgment, and Mr. Justice Blackburn on the 20th November delivered a written judgment in favour of the petitioner, and affirming his right to recover, and, as might be expected from that eminent judge, it is a lucid exposition of the law, which we have much pleasure in presenting to our readers.

The great question, he said, is whether petition of right will lie for any other object than the recovery of specific land or goods, as for breach of contract or for a claim of money either by way of debt or damages. We leave for future discussion who are the proper authorities to contract on the part of the Crown, and what particular contracts are within the scope of such authority—questions not raised in the present case. No doubt contracts may be made on the part of the Crown, and the Attorney-General, on the part of the Crown, can enforce them against the subject; and if the subject has no means of enforcing such contracts against the Crown there certainly would be a want of reciprocity. But it is settled that no action can be brought against the Queen, and that the redress, if any, must be by a petition of right, which is now regulated by 23 and 24 Vict. c. 34. If the suppliant ultimately recovers, he obtains under section 9 of that Act a judgment of the Court that he is entitled to such relief as the Court shall think just, and that form of judgment would be applicable to the case in which it appeared that the plaintiff was entitled to be paid damages for the non-fulfilment of a contract. But the 7th section of that Act expressly provides that it shall not give to the subject any remedy against the Crown in any case in which he would not have been entitled to such remedy before the passing of the Act. Undoubtedly, ever since the Act, a general impression has existed that a petition of right was maintainable for a debt or breach of contract by the Crown. We are now called upon to determine the correctness of this impression, whether before that Act a petition of right lay in respect of the non-fulfilment of a contract made by the authorized agent of the Crown. No statute gives such right, which if it exists must have existed at common law; and unfortunately the authorities to which we must have recourse are many of them antiquated and obscure. The argument against the petition of right lying in such a case is, we think, entirely grounded on the absence of ancient precedents; and that is undoubtedly a strong argument, for all the cases brought before us are cases of petitions to recover lands, except in two instances, one of which was the "Banker's case" in the time of Lord Somers, in both of which freehold annuities were recovered. It is too much to say that all the entries existing must be of this nature, and a search in the Petty Bag Office, where the records of these proceedings are kept, might possibly result in the discovery of some in which there was a judgment in respect of a debt due from or a covenant made on behalf of the Crown. But none such have been produced, and the inferences sought to be deduced from the absence of precedents are that in early times, when the remedy by petition of right was formed, it was confined to cases in which the freehold was concerned, that being the only interest then of sufficient importance to lead to the framing of a remedy, or that from respect to the Crown the remedy was confined to cases in which redress could be granted by an order to the King's officer to withdraw, and did not extend to cases in which, unless the King chose to pay, there could be no effectual relief unless the King's treasure or lands and chattels were taken in execution, and that it could not be supposed that a judgment would be given which could not be enforced. We must observe as to this last argument that the moral effect of such a judgment, though it could not be enforced, must at all times have been great, and without adopting the whole of the polite fiction of the law, which, as, stated by Blackstone, presumed that "to know of any injury and redress it are inseparable in the Royal breast" (2 Com., 255), we may say that at all times the refusal of the Crown to pay its just debts was much more likely to be based on a sincere or pretended denial of the justice of the claim than on a barefaced avowal of an intention to refuse to do right. But we think that in at least one important branch of the law there is sufficient authority to show that a petition of right lay where the judgment could not have amounted to more than a declaration of the title to redress, leaving it to the Crown to give that redress afterwards. This was the case where the King had granted land with a warranty of title, and the title was impeached. In this case the judgment must have been either a dry judgment that the petitioner had a right to recompense in value, or one giving an execution against the lands of the Crown. After noticing *dicta* in the "Year Books" on the subject, the learned Judge proceeded to notice the entries in the *Rotuli Parliamenti* as to petitions which he showed were sometimes petitions of right and sometimes of grace. No one, he said, who looks at the Rolls, as published by the Record Commissioners, can fail to see that many of the petitions were not in the nature of suits after all, while many looked very like suits. We should be sorry if obliged to form an opinion on so obscure a matter as a ground for our decision, especially when such great authorities have differed upon it; and we think that it is not necessary to do so, for the reasons given by Lord Holt in favour of the judgment which was ultimately adopted by the House of Lords as well as for the reasons given by Lord Somers for reversing it. Both lead to the conclusion that a petition of right lies in such a case as the present. The learned Judge then entered into an elaborate examination of the case to show that this was so, and that on all hands it was admitted that a petition of right lay in such a case, though the House of Lords adopted Lord Holt's view that another and more summary remedy, by order of the Barons of the Exchequer upon the officers of the Crown for payment, was also available. The whole tenour of Holt's reasoning is that in any case where there is a legal right against the Crown there must be a legal remedy, and one which could be made effectual; and he expressly says that a petition of right was a remedy, though not, he said, the only remedy. Certainly there is nothing to indicate that in his opinion there was not in the case of a Crown debt even that imperfect remedy. Lord Somers, on the other hand, set himself to prove that petition of right was the only remedy, and says:—

"Indeed, I take it to be generally true that in all cases where the subject is in the nature of a plaintiff to recover anything from the King, his only remedy at Common Law is to sue by petition to the King;" and he expressly mentions debts due from the Crown to subjects. Nor can there be any doubt that he expresses a distinct and considered judgment that a petition of right would lie against the Crown for a simple contract debt, such as for wages; and unless we overrule this opinion, we must give judgment for the petitioner. But we do not find that this opinion of Lord Somers has been ever since questioned; on the contrary, it has been confirmed, as in "Comyn's Digest," title "Prerogative," where it is stated that petition of right lies if the King does not pay debt, as for wages, &c.; and Lord Chief Baron Comyn expresses no doubt as to the soundness of the doctrine thus stated. So in the latter part of the last century, Mr. Justice Buller and Lord Thurlow both stated that a petition of right lay against the Crown on a contract ("1, Term Reports," 178); and a similar opinion seems to have been expressed by the Barons of the Exchequer in a more recent case (6, Simon, 220). In the Baron de Bode's case, in which the point was raised, though not decided, Lord Denman avowed "an unconquerable repugnance to the suggestion that the door ought to be closed against all redress or remedy" (6, "Queen's Bench Reports," 274)—a doctrine much resembling what Lord Somers called Lord Holt's "popular opinion"—that if there be a right there must be a remedy. In Lord Canterbury's case it was decided that the Sovereign could not be sued by petition of right for negligence (1, "Phillip's Chancery Cases," 301), and in a later Case in the Common Pleas it was held that the Sovereign could not be sued by petition of right for a wrong ("Tobin v. the Queen," 16 "Common Bench Reports," N. S. 310). But in neither case was any opinion expressed that a petition of right would lie for a contract, and in the latter case Chief Justice Erle expressly says that claims founded on contracts by the Crown are a class of cases legally distinct from wrongs. In the more recent case of Mr. Feathers, it was assumed on the judgment that petition of right lies where the claim arises out of a contract, as for goods supplied to the Crown on the public service ("Feathers v. the Queen," 6 "Best and Smith's Reports," 294) We think, therefore, that we are bound by the authorities to hold that the judgment on this demurrer should be for the suppliant. Therefore, by the above judgment, an inventor's claim is maintainable in point of law; though the case, not having yet been tried at *Nisi Prius*, and formally adjudicated upon, is not a full and formal settlement of the question, for which we shall watch with interest.

SUBSTITUTE FOR CANTHARIDES.

An order just received by a chemical manufacturing firm of Indianapolis, Indiana, for one thousand pounds of potato bugs, may be classed as one of the curiosities of commerce. It has been discovered that these insects possess qualities which make them a good substitute for the Spanish fly, and there is a prospect that from being regarded as an unmitigated pest they may become a source of actual profit.—*The Druggist* (American).

The Bronze Penny as a Postal Weight.—As the bronze penny weighs very little more than a third of an ounce, it may serve to weigh letters intended for France at the current single rate. Care must be taken that the beam of the balance does not decline on the letter side; and stamping before weighing is desirable.

Reviews.

PROMOTION OF SCIENTIFIC INDUSTRY.

"Journal of the Society for the Promotion of Scientific Industry." No. II. Manchester: Published by the Society at 9, Mount-street, Albert-square.

This is the second number of a periodical record of the work of the society named, the success of which is truly remarkable, for it appears by its first annual report, contained in this journal, that the first suggestion for the formation of a Society for the Promotion of Scientific Industry came from Mr. Frank Spence, in a letter to the *Manchester Guardian* of October 16th, 1872. The correspondence, both public and private, which ensued, and which has been printed and largely distributed, led to a meeting of gentlemen in the rooms of the Chamber of Commerce in that city. At this meeting were present Mr. Hugh Mason, President of the Chamber of Commerce, Mr. J. K. Cross, Mr. Frank Spence, Mr. W. Agnew, Mr. Henry Rawson, Mr. Joseph Thompson, and Mr. Samuel Radcliffe Platt. After considering a plan of such a society, submitted by Mr. W. G. Larkins, then the editor of the "Journal of the Society of Arts," London, it was resolved that the plan, with modifications, be adopted, and donations towards the foundation expenses were then made, amounting to £450.

Mr. Hugh Mason having been elected Chairman of Council, and having from the first thrown himself enthusiastically into the scheme, many other gentlemen soon gave in their adhesion, and it was found that the promoters were justified in the course they had taken. At the end of the first year the society has so able and distinguished a President as the Earl of Derby, and among its supporters many men of rank, science, and influence, whilst the balance-sheet shows that it has had an income of £4,000 to deal with; and with regard to work, it has sent English artizans on a visit to the Vienna Exhibition of 1873, the result of the action of this society being that, by the co-operation of the Chambers of Commerce of Birmingham and Sheffield thirty-five were sent, and the result of their observations has been published in a volume of reports, which the Council venture to think contains much valuable information on the industries represented.

It has also held an exhibition of appliances for the economical consumption of fuel in the beginning of this year, in a building specially erected in Peel Park, Salford, the site for which was generously placed at the disposal of the society by the Corporation of Salford, reports of which, by Mr. W. Gadd, C.E., of Manchester, were given in the Scientific Review. The various exhibits were, it is said, of a much higher class than it was expected could be got together in the short space of time and with the limited means at the disposal of the society; and the attendance of the public was such as to show the council that they were justified in the course they had taken. The exhibition was to have been opened in person by Mr. Isaac Lowthian Bell, President of the Iron and Steel Institute. That gentleman, however, was unavoidably prevented from attending, but an admirable address on the economy of fuel was prepared by him, and read at the inaugural meeting. This address has been printed and circulated along with the other papers of the society. The total number of visitors to the exhibition was 53,480; and the presence of deputations from scientific bodies in France and Germany, and from the Government of the Kingdom of Saxony, showed that the interest extended over a wide area. The Council feel that much of the success of the exhibition is attributable to the valuable counsel and co-operation of one of its members—Mr. William Mather, who personally gave much time and the benefit of his practical experience to the arrangement of the exhibition.

The society has had placed at its disposal a gold medal for the encouragement of the economical production of peat fuel. The conditions under which it shall be competed for have not yet been arranged. Indeed, the specimens and processes exhibited at the recent exhibition go to prove that the problem how to make the best use of the enormous quantities of peat that cover so large a portion of our land is by no means an easy one to solve, and that any attempt to do so requires the most careful consideration. The matter has been placed in the charge of a committee to arrange the competition.

We are much pleased to find that this one year old society can give such a cheering account of its success, and we cannot help thinking that it may be considered a very near relation to the Inventor's Institute, seeing Mr. F. Berger Spence and Mr. Peter Spence, both members of the Council of the Institute, are amongst the most active of the council members of this new society.

Beyond proceedings of the society, the Journal contains important papers on "Anthracen and its Derivatives," by Dr. Gustav Auerbach; on "The Decoration of Ceramic Ware—Pâte-sur-Pâte," by Edward Locke; on "The New Salt-cake Process," by George E. Davis; on "Trade Routes and Fairs on the Northern Frontiers of India;" on "Economy of Fuel in Mills," by A. Hildebrandt, C.E.; on "The Utilisation of Peat;" and Correspondence.

PROTESTANTISM.

"The History of Protestantism." By the Rev. J. A. Wylie, LL.D., Author of "The Papacy." "Daybreak in Spain," &c. Illustrated. Cassell, Petter, and Galpin, Ludgate hill, London.

The "History of Protestantism" will be enriched with original illustrations of a high character, and no expense will be spared to render the work in all its departments worthy of the great subject of which it will treat. Uniform in size and style with "Cassell's Illustrated History of England," it will combine all the valuable features which have secured to that history a circulation far exceeding that of any other history of our country. With the first number of this work has been presented a magnificent presentation plate a copy of the great painting by Mr. E. M. Ward, R.A., "Luther's First Study of the Bible." The engraving of this picture, printed on plate paper, measures 26 in. × 20 in. The work appears to be high-class in every respect, but, as it touches polemical controversy, this is all we can say of it.

CONTAGIOUS DISEASES ACTS.

"Mr. Gladstone and the Contagious Diseases Acts." By Joseph Edmondson. F. C. Banks, 27, Great George-street, S.W.

That the race of Pharisees and pseudo-moralists has not died out is evidenced by the support received for views antagonistic not only to the form and concomitant details of the Contagious Diseases Acts (which, we are free to admit, are not to our liking), but to the very basis of them, namely, governmental regulations to prevent the spread of those dreadful, loathsome social and physical pestilences, the effects of which fall too frequently on innocent and virtuous victims. In this pamphlet we have the old nonsensical ideas put forward that the physical deterioration produced by the unlawful indulgence of the animal passions must not be dealt with, because we may possibly thereby render vice safe and easy—a plea strictly analogous to what might be urged against many valuable social arrangements, as, for instance, fire insurance, which it can be proved often gives encouragement (though, of course, not intentionally) to the crime of arson, and our Marriage Laws to the murder of wives and husbands, to say nothing of wife beating. Why, the very things that most of these very virtuous ladies and gentlemen are prepared to uphold, namely, facility of restoration to respectable life of fallen females, in some cases involving the restoration of an adulterous wife to her husband's bed, are likely to encourage vice and profligacy; inasmuch as after enjoying the pleasures of sin for a season, all can be put right again. As to the argument that the surgical examination of women who have been in the habit of submitting themselves to mercenary prostitution is an unjustifiable violation of their feminine delicacy and sensitiveness, it is all moonshine, for any sensitiveness they can have in such a matter is not worth a moment's thought, considering, too, that in this country women of the highest respectability have not the slightest objection to being handled by male doctors in cases of childbirth and sexual complaints. There is nothing more important for the welfare of society than the *sana corpore*, except its combination with the *mens sana*, notwithstanding all that may be said by statesmen or orators who are making political capital or seeking popular applause. If these Acts are arbitrary (though they are not more so than School Board and Vaccination legislation), if they are one-sided, if in the action of their working details they engender the evils they seek to cure, and we believe there is all this to be said against them, they should be at once amended, and virtuous people will do good service in effecting a proper amendment of them; but in working for their total abolition they are only seeking to uphold transcendental idealities to the detriment of practical social advantage.

EDUCATIONAL ENDOWMENTS.

"The Labour Representation League on the Uses of Educational Endowments." Published by Henry Broadhurst, Secretary of the Labour Representation League, at 5, Catherine-street, Strand, London, 1874.

HAVING in our first article in last month's issue discussed in general terms the scheme propounded on the subject of Educational Endowments and Technical Education by the Labour Representation League, we shall at present merely remark that this sixpenny pamphlet contains a full exposition of that scheme; further, that everyone interested in the subject treated of ought to read it. We may mention, however, that Mr. T. Mottershead, who is so well versed in questions of this sort as to have publicly received, not so very long ago, the commendations of Mr. Gladstone, then Premier, and Mr. Henry Broadhurst, were workers in the production of this pamphlet, so that it may be regarded as the manifesto of working men who are quite capable of dealing with the subject in a proper manner; and, in fact, it presents an unanswerable case for the application of a large portion of our educational endowments to a sound system of technical education which is sketched out in this pamphlet.

SPIRITUAL TELEGRAPHY.

"The Two Discoveries; or Key to Pine's Spiritual Telegraph." This Key not only Unlocks the Abstruse Labyrinths of Mathematical Science, but enables every Person who values the privilege to converse as freely with Friends in Spirit-life as when they were on Earth. Containing a Series of Communications of the most intense interest by this new invention, with an engraving of the instrument. By CLEMENT PINE. London: E. W. Allen, 11. Ave Maria-lane, and Stationers' Hall-court, E.C. Also published by the **Author** at Bridgwater, and to be had of all booksellers. 1874.

THE adherents of Spiritualism will probably find that the invention described in this pamphlet is one tending to advance the cause they have at heart. Not being one of the initiated, all we can undertake to do is, to state that Pine's Spiritual Telegraph is, as far as we can make out, a dial marked with concentric bands, the inner and smaller one having 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, thereon, and the outer and larger presenting the letters of the alphabet, with "&" added. The following directions are given as to its use:—"It is necessary for those not possessing strong mediumistic power to place one or both of the fore and middle fingers lightly on the hand of the instrument near its centre, taking due care to avoid using any power upon it, and to be as passive as possible and alone. It may be some days before any result is obtained. But when a spirit has the power to operate, there is generally first a slow movement of the hand of the instrument, followed by a rapid motion so as to go round several times without stopping. In such case ask the communicating spirit to move the hand more slowly, and stop at the required letters. This being done, it has been my experience continued daily for five months, to have the name of the spirit first spelled out, followed by the communication." The work has an appendix which relates to what is termed a discovery in mathematics, being really dissertations on the properties of triangles, which will be found interesting to all who desire to advance the popularity of geometry.

WOOD'S INSECTS ABROAD.

"Insects Abroad," being a popular account of Foreign Insects, their Structure, Habits, and Transformations. By the Rev. J. G. WOOD, M.A., F.L.S., &c. Author of "Insects at Home," "Homes Without Hands," "Bible Animals," &c. Illustrated with six hundred pictures, by E. A. Smith and J. B. Zweekes. Engraved by G. Pearson. London: Longmans, Green, and Co. 1874.

THIS, like all the productions of Mr. Wood, is full of interest and instruction. His object in the present book, he states, to be two-fold; in the first place, to shew us that the lowly, often despised, and abhorred creatures that move about the earth, always as the insects, often are not mere pests or nuisances, as, in many cases, they do work in the economy of nature, which is of great value to mankind, and the wonderful character of their structure renders them interesting objects of study. Incidentally many remarkable points connected with insect life are described, as, for instance, their being used as food. Thus, the bees not only furnish honey, but in several countries are themselves eaten in the state of grub-dom, together with the "bee bread" laid upon their cells. Several wasp larvæ also are used for food. Even the voracious mosquitoes are in some parts of the world themselves eaten.

It would be a very difficult task to compress into a small space anything like a synopsis of this important work. Our readers must therefore remain contented with a few specimens. The first refers to what may be termed classical insects belonging to the lamellicorns, and termed the scarabeides, one of which is the most celebrated beetle of their race; perhaps the most celebrated insect in the world. This is the sacred scarabæus (Ateuchus sacer), which was held in such veneration by the ancient Egyptians, and which is represented in such profusion on their tombs, and even on their personal ornaments; the reason of its sacred character, or at least one of the reasons, we shall presently see. The mode of depositing its eggs is very remarkable; our British beetles merely dig through the patch of cowdung, carry some of it to the bottom of the hole, and therein lay a single egg. In those places, however, where the sacred scarabæus lives, such a proceeding is impossible, on account of the difference of the soil. The earth of our pasture lands is comparatively soft, and can be easily excavated, but, as a rule, in the country inhabited by the sacred scarabæus, the earth is hard and stony, so that the insect is obliged to search for a spot sufficiently soft to allow her to excavate. It is necessary, therefore, that the beetle should be able to transport from place to place a sufficient amount of the material on which the young larva is to feed, and this she does in a very curious manner. Taught by instinct, she gathers together exactly so much of the material as will give to the future young an ample supply of food, places in the midst an egg, works it into a rudely globular form, and then proceeds on her travels in search of a spot in which she can burrow. The mode of progression also is very peculiar. Turning her back upon the ball, and grasping it with the hind legs, she works backwards, pushing the ball along much as a horse backs a cart. Her perseverance in this work is really wonderful. The task is a very hard one, for the insect cannot see where she is going, and is just as likely as not to push the ball over a steep and stony hillock, which she might have skirted without the least difficulty. When quite tired out, she rests for a while, and then sets off again on her travels, seldom failing in the end to bring her labours to a successful conclusion. Her work is the harder because the ball is never quite spherical. At first, it is made rather at random, and by degrees becomes more rounded as it is rolled; just as a great snowball becomes rounder as well as larger while it is rolled through the snow. Still, the ball is never a smooth sphere, but is of an irregular outline, so that the difficulty of rolling it is much increased. There are two points in connection with this ball which are worthy of notice, the first being the instinctive attachment which the beetle feels towards it, and the second the utter want of reason in such attachment. It is hardly possible to induce one of these insects to abandon the ball which contains her eggs until she has laid it safely beneath the earth. But she cannot recognise her own ball from that of any other beetle; and if two females be engaged in the task of depositing their eggs, and the balls be exchanged, neither insect seems to be conscious of the deception, but labours as cheerfully for the ball that contains her neighbour's egg as she did for that which held her own. For the perfectly instinctive and wholly irrational attachment to the egg ball, we have a parallel in our own country. There are certain little black-brown, swift-footed spiders which spin no webs, but keep to the ground, on which they catch their prey by fair chase. The female wolf spiders, as these creatures are called, may be seen in the summer time carrying about with them a little silken bag, containing their eggs. Nothing can induce them to relinquish their treasure, and the spider would sooner lose her life than her egg-sac. Yet, if, as is the case with the scarabæus, the egg-sacs of two wolf spiders be exchanged, both creatures are perfectly satisfied; and even if a little particle of cotton wool be rubbed up and placed in the way of a bereaved female, she will take it up and carry it about, just as if it were her own egg sac. It is both on account of the shape of the egg-ball made by the scarabæus, and of the intense love which the insect bears for it, that the ancients employed it as an emblem of the Divine Creator's power. The earthen ball, with the egg in its centre, was taken as an emblem of fertility and the attachment of the beetle to the ball was recognised as an emblem of the Creator's love towards his creatures.

Another class of insects possesses a somewhat painful interest, namely, that most important family of neuroptera, the termitidæ, popularly, though wrongly, called white ants, of which Mr. Wood gives the following account:—There are many species of termes, but all are very much alike in their habits. I have, therefore, selected on species, termesdirus, or the common white ant, to serve as an example of them all. These insects are spread over most of the warmer parts of the world, and are useful or the reverse, according to the amount of population. In uninhabited districts the white ants are valuable beyond price, as, together with the wood-boring beetle, they aid greatly in developing the forest-growths. Though they can feed upon many substances, they are essentially eaters of dead wood, and their powers in this respect are almost incredible. Hating light, they always begin their work by boring a hole into the object which they are about to attack, and then devour the whole of the interior. They never break through the exterior, but leave a shell scarcely thicker than ordinary paper, so that nothing on the exterior indicates the vacuum within.

When they get into a house, and attack the woodwork, this habit of theirs is more than unpleasant, as no one knows whether the wood be sound and solid, or hollow and rotten, from one day's end to another. It may look sound enough, but if struck or pressed, the thin shell gives way, and the havoc within is disclosed. In the British Museum is an example of the ravages of the termites, which is so remarkable that it is here given to the reader. The piece of timber in question formed the lintel of a door in the Government offices at Jamestown. It was, originally, a large square beam, but the termites made their way into it, and reduced it to the singular condition which is shown The manner in which the insects have set to work is very curious. After boring a hole into the beam, they began to eat the softer portions of the wood, avoiding for the present all the knots, so as to leave them projecting exactly as they grew in the tree. Having done this, they had begun to destroy the knots themselves by boring tunnels into them, so that there is scarcely a knot without one or two holes in it. When they had proceeded thus far, the mischief was discovered, and the damaged lintel removed and sent to England as an example of the havoc which termites can work. Even furniture is not safe, especially if it be left undisturbed for a few days. Suppose, for instance, that these insects have found their way into a house, and a table has been negligently left without having its feet placed in saucers of water, the termites will begin by boring a hole through the planking of the floor, and into the leg of the table. They will then hollow out that table so completely, that if a weight be placed upon it there is a crash and a smash, and nothing remains of the table but a heap of splinters and a cloud of dust. Several species of termites exist in the warmer parts of Europe, and at La Rochelle they have quite got the upper hand of the inhabitants. Not even a plank can be left for two days without being riddled by these insects, which attack the wooden fences, the stakes to which young trees are tied, and even the trees themselves. They have quite taken possession of the houses. In the Prefecture, for example, they have done terrible mischief. They have burrowed into the woodwork to such an extent that on one occasion when a clerk stumbled as he was going down-stairs, and caught at one of the oak posts of the balustrades, his hand went completely into it, and was buried up to the wrist, the termites having eaten out all the interior, and left nothing but a mere shell scarcely thicker than the paper on which this account is printed. There is every reason for believing that the Prefecture was the original head-quarters of the termites which were brought from St. Domingo by some rich shipowners in the year 1780. Some men were engaged in building a house, which was afterwards converted into the Prefecture, and the termites gained admission by having got into some bales of goods brought from St. Domingo. But, great as is the inconvenience thus caused by these insects, it is as nothing when compared with the irreparable damage which they have done to the very history of the place. They contrived to reach in their silent, darkling ways, the office in which were kept the archives of the department, and every single paper was destroyed without anyone knowing it. They did with the bundles of paper exactly what they do with timber. They first bored into the interior, and then set to work to eat all the paper. But they took care not to bore through the upper sheets, nor to cut through the edges, so no indication of the mischief was given until one day it was discovered that nothing was left of the archives except the upper sheets and the edges of the leaves

“Polarization of Light.” By WILLIAM SPOTTISWOODE, M.A. Macmillan and Co.

THIS is a very important and interesting work, for polarization of light is one of the most captivating of scientific phenomena. The work, amongst many other interesting things, treats of the colours produced by plates of crystal when submitted to the action of polarised light, and describes how, in the phenomena of circular polarization, mechanical means have been used to produce in uncrystalline bodies, particularly in unannealed glass (or glass which has been rapidly and, thereforre, unequally cooled), effects of this kind similar to those naturally produced in crystals. The polarization in the sky or atmosphere, produced by the scattering of light due to the presence of particles of different degrees of minuteness in the air, is then treated of; also the connexion of this with the sun's position in the heavens, and the contrivance of Sir Charles Wheatstone's polar clock to determine the time of day by it. Other bearings of the subject also receive attention.

REVIEWS POSTPONED.

“Brinckley's Astronomy” (Longman)

“An Elementary Exposition of the Doctrine of Energy,” by D. D. Heath, M.A. (Longman).

“Transit of Venus,” by R. A. Proctor, B.A. (Longman).

“The Aerial World,” by Dr. G. Hartwig (Longman).

“Elementary Dynamics,” by W. G. Willson, M.A. (Thacker and Co., Calcutta).

“On the Origin of Civilization and Primitive Condition of Man,” by Sir John Lubbock, Bart., F.R.S.

“The Draughtsman's Handbook,” by G. G. André, C.E. (Spon).

LITERARY ANNOUNCEMENTS.

We read the following in the *Athenæum*:—A curious MS. has just reached this country from Rome. It is entitled, “The True and Wonderful History of the Lamentable Fall of Anthony Tyrrell, Priest, from the Catholic Faith, written by his own hand. Before which is prefixed a Preface showing the causes of publishing the same unto the World.” Tyrrell, who was one of the witnesses against Mary, Queen of Scots, was a sort of Vicar of Bray. He changed his religion three times, but eventually died holding large preferments in the Church of England. The MS., which is now in the Public Record Office, will, it is to be hoped, be published.

The Conseil Municipal of Paris, on which there is a Radical majority, had decided to publish from the city archives a volume “La Prévôté d'Etienne Marcel.” But Etienne Marcel's Commune of Paris was so singularly like M. Félix Pyat's Commune of Paris that the Préfet of the Seine has stopped the publication of the work—at all events, for the present.

Lord Houghton is progressing with a new edition of Keats.

The Christmas story of “Once a Week,” is from the pen of Mr. G. M. Fenn, author of “Ship Ahoy!” and is entitled “Sixty per Cent.: a Domestic Ditty.”

Prof. Vambéry has in preparation a work entitled, “Islam in the Nineteenth Century: an Essay upon the present State of Civilisation in Mohammedan Asia.” The effect of modern ideas upon the social and political condition of the Asiatic Mohammed countries is to be considered, as well as the future of these nations forcibly taken under tutelage by the West. French, English, and German editions are to appear simultaneously.

Lieut.-Col. W. E. Marshall, author of “A Phrenologist among the Todas,” is engaged on a work to be entitled “The Scientific Aspect of Polyandry,” giving the results of travel and residence amongst the races occupying the Western Himalaya Mountains.

“The Supernatural in the New Testament, Possible, Credible, and Historical; or, an Examination of the Validity of Recent Objections against Christianity as a Divine Revelation,” by Prebendary C. A. Row, of St. Paul's, is in the press.

Some curious specimens, says the *Athenæum*, of the new system of photo-lithography as applied to Chinese have recently been brought to our notice. They consist of a series of “Wall Papers,” intended for gratuitous circulation in China, each of which contains in the centre a large engraving of a Bible subject, taken from the *British Workman*, and on either side a description in Chinese, rendered in the words of the Bible These Chinese characters were penned by a Chinese scholar, and by means of photography were transferred by Messrs. Partridge and Co. to stone. They have, therefore, all the appearance of written characters—a circumstance which will, we doubt not, attract the attention of the Chinese who have the taste to prefer the rounded and easy strokes made by a native brush to the hard and angular lines stamped by the metal type usually employed by foreigners in printing Chinese.

By the death of M. Taschereau, recorded a short time ago, the literary world of France has suffered no insignificant loss. As an author, he is best known by his lives of Molière and Corneille, and by his editing of Tallemant des Réaux, and the Grim-Diderot correspondence. He was also a frequent contributor to various journals, the *Revue de Paris* and the *Revue Francaise*. But his chief claim to distinction is his sixteen years of skilful management at the National Library. This post he obtained by entering into political life, and writing in such a way as to be looked upon with favour with the late Emperor.

Mr. Walter Thornbury is preparing for the press a second edition of his “Life of Turner.” It will contain, we are told, many hitherto unpublished letters, and a large number of fresh facts about the painter. Mr. Thornbury will bring out at Christmas a volume, containing a selection from the poems he has from time to time written, under the title of “Twenty-five Years on the Slopes of Parnassus.” It will be illustrated by Messrs. Millais, Tenniel, Sandys, F. Walker, Green, Pinwell, the late T. Morton, Whistler, Houghton, Poynter, H. S. Marks, and the late Mr. Lawless.

An effort is being made to found a Chair for Celtic in the University of Edinburgh. The Council of the University have appointed a Committee, with Prof. J. Stuart Blackie as Convener, to promote the object. The Professor has commenced agitating the question in the North, and has already obtained considerable sums towards the £10,000 required.

Miss Jean Ingelow will contribute a new story to *Good Words* for 1875. The title, we believe, is “Fated to be Free.”

There is a talk of bringing out a magazine, to be called *The Church Quarterly*, as the organ of the “Anglican” party, which has had no representative among the Quarterlies since the decease of the *Christian Remembrancer*.

Mr. D. M. Aird, of the Middle Temple, author of “Blackstone Economized,” &c., has undertaken a work that is nearly completed, "The Civil Law of France to the Present Time," which comprises all the rules of the Code Napoleon. He has appended explanatory notes, which show the analogy that exists between the Laws of France and the leading Principles of the Roman Law.

The New York *Publishers' Weekly* announces that the first volume of a translation of the Count de Paris' "History of the Rebellion," by Mr. L. Tasistro, of Washington, formerly translator for the State Department, may be looked for in November or December.

A new department has been inaugurated in the Guildhall Library and Museum by Mr. Overall, or rather two. The pictures of the Clockmakers' Company make the beginning of an historical loan gallery, and in another hall Mr. Overall has placed their fine collection of proof engravings of Earnshaw, Mudge, Arnold, and so many eminent horologists. If other companies follow the example, Guildhall will soon make its mark among the special museums.

The writer of the article on "English Fugitive Songs and Lyrics," in the current number of the *Edinburgh Review*, is Mr. George Barnett Smith.

Mr. R. K. Douglas, of the British Museum Library, has been entrusted with the task of editing the *Proceedings* of the Oriental Congress, which will include the papers read before the various Sections,

M. Guillaume Guizot, son of the illustrious statesman, has been lately in London, engaged in making researches with respect to Early English literature, especially that of the Chaucer period, on which he is about to deliver a course of lectures at the Collége de France.

A new and revised edition of "The Records of the Past" is in progress, and will shortly be issued.

"THE BOOK-SELLERS' CIRCULAR AND BOOKBUYERS' GUIDE" is the title of a new monthly Journal of current Literature, uniform in size and price with the *Literary Mart.* It is established for the purpose of presenting in a readable form publishers' announcements of new books, through which bookbuyers may obtain such information as is ordinarily afforded by a perusal of the prefaces, or an inspection of the books themselves. It will greatly assist the retail country bookseller (to whom it is supplied at a reasonable rate in special wrappers for circulation among their customers) and be valuable to the bookbuyers. A special Illustrated Christmas Number will be published early in December, to be called "*The Booksellers' Christmas Annual.*" We recommend our readers to apply for specimens to the publisher, Mr. W. E. Goulden, 271, High Holborn, and 131, Fleet-street, London.

EXTERNAL SCREW CUTTER FOR BOTTLE NECKS.

LAUCHLAN ROSE, lime-juice merchant, Leith, and JAMES BROWN, glass-cutter, 14, Arthur-street, Edinburgh, both in the county of Edinburgh, have recently patented "An improved tool or shears to produce an outside screw on the neck of bottles;" and such improved tool or shears they state in the specification of their patent consists in a cup-shaped circular mould, the inner sides or surfaces of which have produced thereon the screw to be produced on the necks of the bottles, and of the required size for the neck of such bottle.

This cap or mould is attached to a tube or casing (usually about six inches long), inside of which tube or casing is placed a plunger of the size required for the inside of the neck of the bottle, such plunger being provided with a spring which is attached to the tool or shears, and so that the workman can press the spring at pleasure, and this, acting upon the plunger, forces it into the cup or mould, by which pressure the glass the cup contains is forced into the thread of the screw, after which, on withdrawing the pressure upon the spring, the plunger recedes to its normal position inside of the tube or casing, when the bottle is to be unscrewed from the cup or mould.

THE NAGPUR WATER WORKS.

THE author, Mr. Alex. R. Binnie, M. Inst. C.E., in this paper, which was read at the Institution of Civil Engineers on November 10th, described the position of Nágpur, the geological formation of the district, and the former works of water supply. The population of the city was 84,000, and the annual rainfall was 40·73 inches, of which 37·52 inches fell in the monsoon months The new works had been constructed on the basis of an old native tank at Ambajhari, four miles from the city. The present reservoir had a total capacity of 257,500,000 cubic feet, with a water surface of 370 acres. It was fed by a catchment area of 4,224 acres, and was calculated to afford a daily supply of 15 gallons per head, under all the circumstances of fluctuating rainfall and of years of extreme drought. The embankment of the reservoir was 1,033 yards in length, and was formed on the site of the former one, through which a puddle trench had been sunk, and afterwards the bank was raised 17 feet 4 inches. Floods were discharged over a weir 200 feet long. The water for the city was drawn off through a straining tower in the reservoir, by a syphon which passed over the old embankment and below the newly raised portion. It was conveyed to the city in a cast-iron main 13 inches in diameter, and was distributed through a length of 10,500 yards of smaller pipes. The water service was principally a public one. The cost of the works had been £40,000, being at the rate of 9s. 5d. per head, or £31,500 per million gallons of water supplied per day.

In 1872, the intensity of the rainfall at Nágpur varied from a rate of $\frac{1}{2}$ inch up to 4·733 inches per hour; the heaviest fall recorded was 3 55 inches in forty-five minutes. In an extreme case, 98 per cent. of the rainfall flowed off the drainage area in two hours and fifty minutes. The average yield of the drainage area was 38 per cent. per annum of the rainfall. The capacities of reservoirs to afford certain quantities of water at Nagpur were stated in a table, from which it appeared that a supply for two years should always be the limiting capacity for safety. From one season's observation the author believed that the evaporation from the surface of the reservoir amounted to 4 feet, or about 1-5th inch per day, and that the quantity of water lost to the reservoir by evaporation during the dry months was 54 per cent.

From a study of the records of rainfall at Calcutta, Bombay, Madras, Nágpur, Mauritius, Barbadoes, Adelaide, Hobart Town, Cape Town, New York, Rome, Greenwich, New Bedford, U.S., and Prague, the author deduced that the fluctuations were similar in kind, and that they only differed slightly in amount. He compared them under the following heads, the results being given in a table: per centages of the number of years whose fall was above or below the average; the average fall of all the years above and below the average; the average fall of the three driest consecutive years; the maximum and minimum fall, and the extreme range or difference between them; the proportionate number of periods of three consecutive years below the average per hundred years; the greatest number of consecutive years below the average; and the average fall of the greatest number of consecutive years below the average. The author did not advocate any strict rule to be applied in all cases, but pointed out certain broadly-marked features, which he considered generally applicable to India, as well as to other parts of the world. He also investigated the probability of the fluctuations of the rainfall being affected by the solar spot periods. The results were recorded in a series of tables, the conclusion arrived at being that the suggested connection could not be proved, and that even if it existed, the amount was too small to be of professional importance.

RICHARDS' MONEY-TAKING REGISTERING APPARATUS.

THE object of this invention is to provide an apparatus whereby each person employed to receive money, either omnibus or tramway fare, admission to places of amusement, for refreshments or otherwise, confirms the same in the presence of the person paying, either by pressing a button, actuating a lever, turning a handle, or any other manner that gives the necessary motion to the machinery, which records the payment on a dial, and at the same time strikes a bell or similar contrivance to indicate to the ear that such payment is recorded.

The machine, in its simplest form, consists of two metal plates in a perpendicular position, with pillars between them, similar to an ordinary brass clock frame.

Between these plates is a horizontal ratchet wheel, fixed to a perpendicular shaft, revolving freely in its bearings. A horizontal rod, somewhat longer than the distance between the plates, protrudes through the front plate, a length equal to the distance between the teeth of the ratchet wheel; this rod is guided within the frames, and at the end protruding is fixed thereon a knob or button.

The horizontal rod is provided with a pall or detent, which falls into one of the spaces of the ratchet wheel, so that when the button, at the end of the bar, is pressed or pushed forward, the ratchet wheel is made to move a distance equal to that from one tooth to another. A spiral or other spring causes the bar to return to its former position. To prevent the ratchet wheel returning there is a second pall or detent as ordinarily practised in mechanics, and to this pall is attached the hammer for striking the bell, a spiral or other spring retaining the pall in its position.

Attached to the ratchet wheel is a cylinder having on its periphery figures engraved, corresponding with the teeth, which figures are seen through an opening in front plate of machine; thus, by pressing the button, the payment is indicated on the cylinder, and at same instant the bell is struck, so conveying to the ear as well as to the sight that the amount is recorded.

For the purpose of indicating large numbers on the top of the shaft of the ratchet wheel, is employed (although any gearing may be adopted), by preference, a worm working into a toothed wheel, and the axle of this wheel may carry a hand, so indicating on a dial the number of payments made, or there may be a series of dials similar to those of a gas meter.

The machine described is intended only to record like amounts, but when there are several amounts as 2d., 3d., 4d., &c., a distinct apparatus, being combined or separated, is requisite for each amount, the bells having different notes, so that an accustomed ear can detect by the sound the amount recorded.

Various modifications of the instrument can be made, either by placing the ratchet wheel in a vertical position, and giving the motion from above, as would be the best method for counters or other fixed places.

For setting the machine at zero, as at the commencement of the day or week as the case may be, the bottom of ratchet shaft is squared, and there being a corresponding hole or holes at the bottom of machine, with a suitable key, the pointers are placed as required. To prevent fraud at this point, the holes are covered by a plate, secured either by lock and key, seal, or other means. The instruments can be made so as to be portable, the conductor of a tram-car having it attached to a belt, so in the act of receiving money in the presence of the person paying indicates it on the machine.

I also purpose to attach, when desired, a clock with dial or other contrivance, so as to show the precise hour or time when the payments are made. The apparatus above described may be modified in various ways, so as to obtain the same results.

The inventor and patentee of this ingenious invention is Mr. William Richards, of Burton-road, Brixton.

PROMOTION OF INFECTIOUS DISEASES BY SCHOOL BOARD ACTION.

THE following case, illustrating the harsh, unthinking, mode of action of the School Board zealots, cannot be too widely known, as it is only one sample of the doings of those who, by so called popular election, have been put into high places to popularise education, but who are in reality rendering it odious to the people:—In the *Times* of Nov. 9, 1874, Dr. W. Vacy Lyle, M.D, medical officer, Western Paddington, wrote to state that a poor woman named Turner, 21, Alfred-road, Harrow-road, was summoned at Marylebone Police Court for neglecting to send her children to school, and was, by the magistrate, fined three shillings or three days' imprisonment, and having no money was sent to prison for three days. It seems one child had been sent to Stockwell Hospital by Dr. Lyle for fever, and she gave this as reason for keeping her children away from school; she was a widow in much distress, and if the people of the house in which she lived had not looked after her children they would have starved during her imprisonment; when she came out of prison she was relentlessly summoned again before the magistrate; but being this time armed with the doctor's certificate, was lucky enough to find the magistrate in a mood to excuse her.

The matter having thus been brought prominently before the public by so influential a journal as the *Times*, it got some notice taken of it by the supreme authority. At the London School Board, in full meeting assembled, on the 19th November, according to the *Times* report, the chairman stated that Dr. Lyle had (in consequence presumably of communications from the School Board) written a letter stating that, had he known that the woman was such an offender, in regard to keeping her children from school, he should not have written to the *Times* as he did. A letter had also been received from the clergyman of the parish, approving of the action of the Board in respect of this prosecution — just as if, supposing the delinquencies of this poor woman to be as represented, anything could justify forcing her to send her children to school at a time when it might be reasonably expected they were either carriers of infection or sickening for infectious disease. It is really alarming to think how diseases may be propagated by compulsory school attendance, which our educational zealots, one may be sure, will never allow to have been due to that, but will rather seek for all sorts of nonsensical theories to account for the spread of such diseases. The whole case forcibly illustrates how vain man, dressed up in a little brief authority, plays strange fantastic tricks. The School Board people proceed to fill their schools, regardless of poverty or of disease, with stern disregard for hunger or illness, it being with them a favourite notion that it is of very little consequence what becomes of the body so long as the mind is well filled with book-lore. The magistrate rigidly enforces the law much in the same spirit. The doctor, after pleading for the victim, is half ashamed of what he has done; and even the minister of the God of mercy rejoices! the School Board making all smooth and pleasant in the end with "Hear, hear, hear."

OPENING OF SESSION OF INVENTORS' INSTITUTE.

ON Thursday, 26th November, a Special Conference of the Council of the Institute, members, and friends of Patent Law Amendment, was held at 4 o'clock p.m., at 4, St. Martin's-place, Trafalgar-square. Pending the arrival of the President of Council, Sir A. BRADY, Mr. H. A. FLETCHER, F.R.A S., a council member of long standing, occupied the chair, which was afterwards filled by the President.

The Secretary, Mr. F. W. CAMPIN, commenced proceedings by stating that it had been thought desirable, as there would be a number of members from the country coming up to town to the Opening Dinner of the Session, to be held that evening at St. James's Hall, to devote this meeting to discussing and settling the nature of the arrangements with regard to the deputation to the Lord Chancellor on the subject of the Patent Laws, a matter which had now become an immediate one, as his lordship had fixed the 16th December as the day for receiving the deputation

Mr. Campin then remarked that the practical business of the meeting would be to settle the list of members to attend the deputation, and arrive at a concurrence of views as to what should be stated as the requirements of the Institute in regard to patent reform, as a guide to which he would state that in the spring of this year a printed slip was issued to all the members, requesting them to give their views on four principal leading points; and these had all been affirmed by a great number of members. They were:—

1. Cheaper patents.
2. Better procedure for obtaining patents, so that by preliminary investigation the soundness of patents should be practically guaranteed, with provisions for establishing them as indefeasible, and preventing fraudulent grants.
3. Improved Patent Office and Museum arrangements.
4. Better protection by a more certain and less costly system of law process for supporting patents against infringers.

All these points were embodied in the proposed Bill, which, as also an abstract, had been already printed and published in the Institute's journal, THE SCIENTIFIC AND LITERARY REVIEW.

Sir ANTONIO BRADY remarked that having given great attention to this subject, and having had the opportunity of personally examining the working of the Patent Laws of America when in that country not long ago, he was decidedly of opinion that we could not do better than take the general principle of those laws as the basis of an amended Patent Law for our own country, for his own view was that if the Government granted a patent it ought to take care that it was granting a thing of some value that could not be upset in a court of law without difficulty, indeed with sufficient previous notice and investigation, he did not see why a patent should not be rendered absolutely indefeasible. This was, in a great measure, effected by the American system of preliminary examination, which he could bear testimony was conducted in a most admirable manner; and as regarded their Patent Museum, it stood out in splendid contrast to our own miserable corner at South Kensington, and he thought that an improved museum should be an important point in an amended patent system. He and other members of the Institute had formed part of a deputation to the late Lord Chancellor to bring under his notice the disgraceful state of the Patent Museum, and they had convinced his lordship of the necessity for immediate action in the matter; but, of course, the late change of Government had prevented any practical results accruing from this up to the present time. Sir Antonio then adverted to several cases of legal proceedings in regard to patents, showing that a patent was a mere title to go to law, and was in reality a standing disgrace to our national character. He was glad to find amongst them several representatives of the working classes whom he had had the pleasure of meeting at the Conference held by the Institute in August last, and this led him to remark that there was a question now coming before the public, specially affecting working people, which to his mind was intimately connected with the Patent Laws, namely, technical education, for if that be improved and the Patent Laws left without amendment, it will be said how absurd to train a man to become an ingenious mechanic and then to deny him any advantage from the exercise of his ingenuity.

Mr. PATERSON said, as one of those so kindly alluded to by the President, he must observe that it appeared to him that the present Patent Law was a miserable rag of the old feudal system, and required reform root and branch. As far as workmen are concerned, what was wanted was cheap patents and efficient protection.

Mr. SAVAGE concurred in these views.

Mr. NEWTON WILSON said he would like to know how this could be carried out in practice.

Mr. BLANCHETT moved, Mr. HAND seconded, and it was carried unanimously, that those present, with power to add to their number, do form a committee of deputation to the Lord Chancellor.

Mr. BROADHURST expressed his approval of all that had been said that evening, remarking that for himself he had only to say he was quite ready to join in the movement for amending the Patent Laws, which should go hand in hand with technical education, for he felt that the two combined would render inestimable benefits to the working classes, and be of the greatest good to the country.

Mr. BANTING ROGERS thought that the increase of the Protection of Patents was far more important than the rendering them cheaply obtainable.

Captain SELWYN, as an old member of the Institute, was pleased to find that some amendment of the Patent Law was likely to be brought about, and he hailed with pleasure the right hand of assistance held out by the working men, whom he did not doubt would do good service to the movement. Although he well knew that the Bill prepared by the Institute was a real practical measure, he thought it would be unwise to urge it as the right thing to be done, and he would move that a sub-committee be appointed to act in accordance with the following instructions:—

To arrange the deputation, whose duty will be to urge the amendment of the Patent Laws on the principle of the American system. To propose the views of the Inventors' Institute as worthy of consideration *pari passu*, with any others, for the future amelioration of the American system in the sense of indefeasibility of patents, and the extension of patents which have been unremunerative.

This being seconded by Mr. VARLEY, was carried unanimously. It was then agreed that the President of Council, the Secretary, and Captain Selwyn, Messrs. Paterson, Varley, Savage, and Broadhurst, be a sub-committee to make arrangements as to the deputation, and with a vote of thanks to the Chairman, the meeting ended.

The dinner took place at St. James's Hall the same evening; it was well attended, Sir Antonio Brady presiding. Major Beaumont, M.P., Captain Selwyn, R.N., Captain Greenfield, R.A., Mr. Campin, the secretary, and Messrs. F. Ransome and Hume Williams. Several eminent American and other foreign inventors were present and responded to toasts. We are, however, compelled to defer our report till our next.

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THE INVENTORS' INSTITUTE,

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Established 1st May, 1862.

Past Presidents:

Sir David Brewster, K.H., LL.D., F.R.S., &c., from the establishment of the Inventors' Insitute, till his decease, February, 1868. Lord Richard Grosvenor, M.P.

President of Council:

SIR ANTONIO BRADY.

MEMBERS MEETINGS AT 8 P.M.

Thursday, December 3rd, Captain Bingham, "On a Double Blade Propeller," and "On Engine Room Skylights."

Thursday, December 17th, W. Gadd, Esq., C.E., "Combustion of Oils for Steam Generation."

Council and Executive Meetings on the same Evenings at 7 p.m.

Subscriptions are payable to Mr. G. A. Stretton, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.
F. W. Campin, Sec.

Proceedings of the Institute.

At the meeting of Council (special and ordinary) held on 12th Nov., 1874, Mr. F. H. Varley, V.P.C., presiding, the Secretary was directed to at once take measures to forward the Patent Law Reform movement, in accordance with former resolutions of the Council.

It was resolved unanimously that the opening dinner of the session, 1874-1875, take place on 26th November.

It was also resolved that the meeting on the 26th be held at 4 p.m., and that its proceedings be restricted to arranging for a deputation to the Lord Chancellor on the subject of Patent Law Amendment. With this the proceedings of the Council terminated.

At the Executive Committee held immediately after the above Council, the question of papers to be read and subjects for discussion at the members' meetings in the present session was considered. The papers to be read by Capt. Bingham were accepted, also a paper by W. Gadd, Esq., C.E., Manchester, on and it being intimated that papers on Railway Carriages, and on the Conveyance of Gunpowder were likely to be brought forward, it was agreed that these would be eligible. It was resolved unanimously that the Executive hereby approves of the proceedings of the Dinner Committee, and requests them to proceed with their work so that the dinner may be held on 26th November. It was also resolved that it is desirable to print the Patent Law Bill of the Institute in a separate form. It was further resolved that it is advisable to have some members' meetings devoted to the demonstration of 'Groups of Inventions,' and two members were constituted a Sub-Committee to consider and report thereon.

It was resolved that the meeting on 26th be held at 4 p.m. (see resolutution of Council).

The proceedings of the meeting of 26th November will be found in another column.

Monthly Notices.

The Transit of Venus Expeditions.—Intelligence has been received of the safe arrival of most of the English transit-of-Venus observers at their head-quarters of destination.

The quicker Oxidation of Iron Rails when not travelled on over those travelled on was affirmed at the American Association for the Advancement of Science by Prof. S. S. Haldeman, of Harrisburg, Pennsylvania, and has been confirmed by Prof. Van der Weyde.

Prof. Wahl has, says the *Athenæum*, given the following statement of observations made by him during a balloon ascent with Prof. Wise. The maximum temperature observed at starting was 97 deg., which continued for 1,300 feet; at 2,000 feet it was 96 deg.; and at 3,800 feet, 85 deg. This gradual fall went on until the greatest altitude was attained, 8,743 feet, when the temperature was but 68 deg.

Prof. Tomlinson's experiments on films of oil formed on water, and his suggestions that they might be employed as a means of detecting adulteration, have engaged the attention of a lady, Miss Kate Crane, who, in the *American Journal of Pharmacy*, gives an account of her experiments, confirming all that Mr. Tomlinson has done—the different shapes taken by drops of oil allowed to fall on water, distinctly indicating the character of the oil.

A new form of galvanometer has been described by Prof. Guthrie in the October number of the "Philosophical Magazine." In general forms it looks somewhat like a common tortoise-balance, and its principle depends upon the measurement of the strength of the current by determining the mechanical force necessary to bring two electro-magnets within a given distance of each other, after they have been excited by the current so as to be mutually repellent. By means of this instrument the absolute magneto-value of the current may be readily determined.

Prof. Reusch, of Tübingen, has described in Poggendorff's *Annalen* some experiments on diffusion between dry and moist air in a glass tube, the two media being separated by a porous plate of hydrophane. The fine series of experiments of diffusion by the late Prof. Graham appear to have suggested a numerous class of experiments similar to the above, all of them confirming the law enunciated by Graham.

The Board of Trade have ordered a cœlometer (Mr. Adams's instrument for illustrating elementary astronomy) to be placed in their examinating department at Tower Hill; and the committee of Her Majesty's training ship Conway, at Birkenhead, have ordered one for the use of their boys.

The Institution of Civil Engineers intend in future to print—1st. Memoirs which, from their abstruse character, are more suited for private study than for reading and discussion before the members at large. 2nd. Abstracts of some of the more important essays published by analagous societies abroad, and in foreign engineering and technichal journals of repute, the design being to publish if possible a *Quarterly Journal*, which, in addition to being the official record of the Institution, shall accurately reflect the modifications and developments of engineering pregress throughout the world.

The death of Dr. Lankester, F.R.S., has occurred since our last publication took place. He was born in 1814, within a mile of the town of Woodbridge, in Suffolk. He received his medical education at University College; after which, in 1839, he obtained his M.D. at Heidelberg. In 1845 he was elected a Fellow of the Royal Society, and in 1862 was appointed Coroner for Central Middlesex. Between two and three months ago symptoms of diabetes manifested themselves, and his death was directly caused by the formation of carbuncles, one of the most painful *sequelæ* of that disease. In connection with his lamented decease we may mention that the Coronership thus rendered vacant has been filled by the appointment of Dr. Hardwicke, late Deputy Coroner, an old member of the Inventors' Institute, and a most worthy successor to Dr. Lankester.

The Council of the Society for the Promotion of Scientific Industry are making arrangements for an exhibition in Manchester in 1875, of appliances for economizing labour.

Information has been received by the Liverpool Chamber of Commerce that the authorities of Algiers have resolved on holding a grand Exhibition there, to commence in November 1875, and continue until the following year.

The Felt Makers' Company of the City of London have agreed to offer the Freedom of the Company and money prizes for works of merit in that trade.

Proceedings of Societies.

ROYAL INSTITUTION.

NOVEMBER 2ND.—Warren De La Rue, Esq., D.C.L., V.P., in the chair.—Mr. C. F. Moxon, Sir D. L. Salomons, Bart., and Mr. H. A. Smith, were elected Members.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

NOVEMBER 3RD.—S. Birch, LL.D., President, in the chair.—The following papers were read: "The Languages of the Cuneiform Inscriptions of Elam and Media," by the Rev. A. H. Sayce, M.A.,—and "Four new Syllabaries and a Bilingual Tablet," translated and edited by H. F. Talbot.

GEOGRAPHICAL SOCIETY.

NOVEMBER 10TH.—Major General Sir H. C. Rawlinson, President, in the chair.—The following gentlemen were elected Fellows: Major J. G. Forbes, R E., Messrs. J. Booth, J. T. Edmonds, and W. Firth.—After the President's opening Address, the following paper was read: "On the Discovery of New Arctic Lands by the Austro-Hungarian Expedition of 1872-74," by Lieut. Julius Payer.

GEOLOGICAL SOCIETY.

NOVEMBER 4TH.—J. Evans, Esq., President, in the chair.—Messrs. H. M. Whitley and H. Brothers were elected Fellows.—The paper read was, "Notes on the Comparative Microscopic Rock Structure of some Ancient and Modern Volcanic Rocks," by Mr. J. C. Ward.

ENTOMOLOGICAL SOCIETY.

NOVEMBER 2ND.—Sir S. S. Saunders, President, in the chair.—Mr. M'Lachlan exhibited a printer's block (such as is used for printing posters) attacked by a species of Anobium, and said he was informed that the insect was causing serious damage to the printer's stock. The wood was believed to be peartree. He had recommended soaking them in a mixture of carbolic acid and water. Dr. Sharp communicated "Descriptions of new Genera and Species of Pselaphiæ and Scydmænidæ, from Australia and New Zealand." He added some remarks respecting the importance of gaining a knowledge of the New Zealand Fauna, and commented on the probable extinction of many of the species at no very distant period.—Mr. Darwin communicated some remarks by Mrs. Barber, of Griqualand, South Africa, on the larva of *Papilio Nireus*, and especially with regard to the colour of the pupa in connexion with the objects on which it was placed, it appearing to assume a protective resemblance to the leaves or other adjacent objects. A discussion took place as to whether, as suggested by Mrs. Barber, some photographic influences might be at work; but Mr. Meldola stated that no known substance retained permanently the colour reflected on it by adjacent objects, but that there was no difficulty in believing that larvæ might become affected in colour by the colouring matter of the food plant, since chlorophyll, in an unaltered condition, had been found in the tissues of green larvæ.—Mr. O. Ward sent some notes on a spider's nest found in a quarry at Poissy, near the Seine, with remarks thereon by Mr. C. O. Waterhouse.—Mr. Butler communicated "Descriptions of Three New Species and a New Genus of Diurnal Lepidoptera from West Africa, in the collection of Mr. A. Swanzy."—Mr. C. O. Waterhouse read "Notes on Australian Coleoptera, with Descriptions of New Species."—Mr. Kirby contributed a review of Boisduval's "Monographie des Agaristidées," publised in the *Revue et Magasin de Zoologie*, 1874.—The Rev. R. P. Murray communicated "Descriptions of some New Species of Butterflies, belonging to the genus Lycæna."

CHEMICAL SOCIETY.

NOVEMBER 4TH.—Prof. Odling, President, in the chair. The following papers were read: "On Methylhexyl Carbinol," by Dr. C. Schorlemmer,—"On the Action of Organic Acids and their Anhydrides on the Natural Alkaloids," Part I., by Dr. C. R. A. Wright,—"Action of Bromine in the presence of Water on Bromopyrogallol and Bromopyrocatechin," by Dr. J. Stenhouse,—"Action of Baryta on Oil of Cloves," by Prof. A. H. Church,—"Observations on the Use of Permangate of Potash in Volumetric Analysis, and on the Estimation of Iron in Iron Ores," by Mr. G. A. Parnell,—"Further Researches on Bilirubin and its Compounds," by Dr. J. L. W. Thudichum.

MICROSCOPICAL SOCIETY.

NOVEMBER 4TH.—C. Brooke, Esq., President, in the chair.—A number of donations to the Society were acknowledged.—Messrs. T. W. Williams and J. W. Goodinge were elected Fellows.—A paper by Dr. J. Fleming, "On Microscopical Leaf Fungi from the Himalayas," was taken as read; it was illustrated by drawings, and many of the species described had been identified by Mr. M. C. Cooke as being the same as those known in Europe.—A paper by the Rev. W. H. Dallinger and Dr. Drysdale, in continuance of their series "On the Life-History of the Monads," was read by the Secretary. It minutely described a form repeatedly met with in macerations of the heads of cod-fish and salmon, and traced the development and reproduction in all stages, and was illustrated by drawings which were enlarged upon the black board by Mr. Charles Stewart. The observations had extended over several years, and had been conducted with the greatest care under various powers up to 1-50 inch. The results of experiments were also given, and conclusively showed that exposure to temperatures of 220° and 300° Fahr. had failed to destroy the germs of these organisms. Some interesting living objects, stated to be larval forms of the common cockle, were exhibited and described by Mr. Wood; but the similarity of these forms to some which were exhibited at the previous meeting, and presumed to be *Bucephalous polymorphus*, having been pointed out by Mr. Stewart, a discussion followed, in which Mr. Wood, Dr. Moore, Mr. Slack, Mr. Stewart, and the President took part.

INSTITUTION OF CIVIL ENGINEERS.

NOVEMBER 10TH.—Mr. T. E. Harrison, President, in the chair.—The paper read was, "On the Nágpur Water-works; with Observations on the Rainfall, the Flow from the Ground, and Evaporation at Nágpur; and on the Fluctuation of Rainfall in India and in other Places," by Mr. A. R. Binnie, which we give in another column.

MATHEMATICAL SOCIETY.

NOVEMBER 12TH.—Dr. Hirst, President, in the chair. The chairman drew attention to the fact that, as on his entry upon his office two years ago he had to announce the death of Dr. Clebsch, so now, as he was vacating it, he had to tell the meeting of the loss the Society had sustained by the recent death of its sole remaining German Honorary Member, Dr. Otto Hesse.—The treasurer (Mr. S. Roberts) stated that Rayleigh's donation had been invested in Guaranteed Indian Railway Stock.—Dr. Hirst gave a short account of the history of this donation and its proposed application to help in defraying the expenses of publishing the Society's Proceedings, and in the purchase of mathematical journals.—The Council, and the gentlemen whose names were given a short time since in the *Athenæum* were declared to be duly elected.—Dr. J. Casey was elected a member. Mr, E. Carpmael was admitted into the Society. Messrs. H. Hart and Nanson were proposed for election.—Dr. Hirst gave an account of his paper on Correlation in Space,"—Mr. J. H. Rohrs read an abstract of his communication "On Tidal Retardation,"—and a paper by Prof. Wolstenholme, "On a New View of the Porism of the In- and Circumscribed Triangle," was taken as read.

ANTHROPOLOGICAL INSTITUTE.

NOVEMBER 20TH.—Professor Busk, President, in the chair.—Reports were read by Mr. F.W. Rudler, "On the Anthropological Department of the British Association at Belfast," and by Mr. Hyde Clarke "On the Anthropological Section of the International Congress of Orientalists, recently held in London."—A paper was read by Col. Lane Fox, "On a Series of Flint and Chert Arrow-heads and Flakes from the Rio Negro, Patagonia, with Some Remarks on the Stability of Form observable in Stone Implements." The series of specimens exhibited was selected from a collection of 500, gathered by Mr. W. H. Hudson on the margin of the river and over an extent of about ninety miles; and on the numerous lagoons, now mostly dry, with which the valley is everywhere intersected. The valleys in that region run through high-terraced table-lands; and on the plateaux above there is no water and but very scanty vegetation, which would seem to indicate the improbability of their having been occupied by man. A number of the implements were discovered by Mr. Hudson on the sites of villages along the valley, and in circular flattened mounds of clay, measuring from six to eight feet in circumference. The different styles of workmanship observed in the different villages were not, in the opinion of Mr. Hudson, to be attributed to the variety of the material employed, but to the degree of skill possessed by the inhabitants of such villages. The author drew attention to the fact of the arrow-heads having long fallen into disuse among the Tehuehches and other Patagonian tribes, who now employ, and for some centuries past have employed, the spear. Col. Fox proceeded to describe in detail the weapons and their varieties of workmanship, and showed that they all presented the same general features as implements found in the United States. He believed that, owing to our inability to understand the uncultured mental condition of savages and prehistoric races, we often lose sight of the inferences deducible from the stability of form observable in their arts and implements, and attach less importance than should be attached to minute varieties of structure.—It was announced that the Council had resolved to publish in the Journal of the Institute, bibliographical notices, abstracts and reviews of English and foreign works and papers, and other miscellaneous matter of anthropological interest and importance.

ZOOLOGICAL SOCIETY OF LONDON.

NOVEMBER 3rd, 1874.—Dr. A. Günther, F.R.S., V.P., in the chair.—The secretary read a report on the additions that had been made to the society's menagerie during the months of June, July, August and September, 1874, and called particular attention to a pair of Arabian gazelles (*Gazella arabica*, Hempr. et Ehr.), from Aden, presented by Mrs. Benecke, July 25th; two specimens of a remarkable large skink (*Macroscincus cocteauii*) found in *Ilot blanc*, one of the smaller Islands of the Cape de Verd group, presented by Professor Barboza du Bocage, C.M.Z.S., August 14th; and a one-wattled cassowary (*Casuarius uni-appendiculatus*), obtained in New Guinea, and presented by Captain Maisby, R.N., of H.M.S. Basilisk, August 25th. Mr. Sclater gave an account of some visits he had recently made to several Zoological Gardens and Museums in France and Italy, and made remarks upon some of the principal objects noticed therein. Mr. G. Dawson Rowley, F.Z.S., exhibited and made remarks upon some rare birds from New Zealand, amongst which were fine examples of *Apteryx haasti*, and a living pair of *Sceloglaux albifacies*. Mr. A. R. Wallace, F.Z.S., exhibited some rhinoceros horns, obtained in Borneo, by Mr. Everett, proving that this animal was still found living in that island. Mr. J. Gould, F.Z.S., exhibited a drawing of a new parrot, of the genus *Aprosmictus*, recently obtained on the Darling Downs, in Queensland. Mr. Gould proposed to call this bird *Aprosmictus insignissimus*. A letter from Mr. Swinhoe was read respecting some bats obtained by him at Ningpo. A communication was read from M. L. Taczanowski, conservator of the museum at Warsaw, in which he gave a list of the birds collected by M. Constantine Jelski, in the central part of Western Peru. Amongst these were 18 species described as new to science. A communication was read from Mr. Frederick Moore, giving descriptions of some new Asiatic lepidoptera. A communication was read from Mr. George Gulliver, F.Z.S., containing measurements of the red corpuscles of the blood of *Hippopotamus amphibius*, *Otaria jubata*, and *Trichecus rosmarus*. Mr. R. Bowdler Sharpe, F.Z.S., read a paper entitled, Contributions to a History of the Accipitres or Birds of Prey. The first of this series contained notes on the females of the common and South African kestrels. A communication was read from Mr. Henry Adams, giving the descriptions of some new species of shells from various localities, also of a new genus of bivalves from Mauritius. Mr. A. H. Garrod read a paper on points in the anatomy of the parrots which bear on the classification of the sub-order. This memoir was based upon the examination of a large number of individuals belonging to 79 species, chiefly from the society's living collection, and contained a new arrangement of the group based principally upon the arrangement of the carotid arteries; and, the presence or absence of the *ambiens* muscle, the *furcula* and the oil-gland. A communication was read from Mr. G. B. Sowerby, jun., giving the descriptions of five new species of shells from different localities. A communication was read from Mr. E. P. Ramsay, C.M.Z.S., wherein he described five new species of Australian birds, and of the egg of *Chamydodera maculata*. The birds described were—*Cypselus terræ-reginæ*, *Æluredus maculosus*, *Ptilotis frenata*, *Eopsaltria inornata*, and *Rhipidura superciliosa*.

November 17th.—George Busk, Esq., F.R.S., V.P., in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of October, and called particular attention to a Gentoo Penguin (*Pygoceles tæniatus*) from the Falkland Islands, purchased October 22nd, being the first example of this species of Penguin received alive, and a Tooth-billed Pigeon (*Didunculus strigirostris*) from the Samoan Islands, deposited by Mrs. Boddam-Whetham, October 23rd. The Secretary exhibited on behalf of the Rev. J. S. Whitmee, C.M.Z.S., an egg of *Pareudiastes pacificus*, and an accompanying egg of the Samoan *Porphyrio*. A communication was read from Sir Victor Brooke, Bart., containing some remarks on the identity of a certain deer in the Society's collection, which had been determined as *Cervus savannarum*. A series of eggs of Megapodes (*Megapodius*) transmitted by Mr. John Brazier, C.M.Z.S., was exhibited. These had been obtained from different islands of the Solomon group. Mr. R. B. Sharpe also exhibited some Megapodes' eggs from the southern part of New Guinea. Professor Mivart read a paper on the axial skeleton of the Struthionipæ, and pointed out that, judging by the characters of the axial skeleton, the Emeu presents the least differential type; from which *Rhea* diverges most on the one hand and *Apteryx* on the other; that the resemblance between *Dromæus* and *Casuarius* is exceedingly close, while the axial skeleton of *Dinornis* is intermediate between that of *Casuarius* and *Apteryx*; its affinities, however, with the existing New Zealand form very decidedly predominating. A communication was read from Major H. H. Godwin-Austen, F.Z.S., describing five new species of *Helicidæ*, of the sub-genus *Plectopylis*, from the Khasi and Naga Hills, from Darjeeling and from the Burmese region. Mr. R. Bowdler Sharpe, F.Z.S., read a paper on the Larks of Southern Africa, in which an attempt was made to reduce into order numerous genera and species of this difficult group. A communication was read from Dr. John Anderson, F.Z.S., pointing out that his *Macacus brunneus* was truly distinct from *M. arctoides* of Geoffr. St. Hiliare. A communication was read from the Count Turati and Dr. T. Salvadori, describing a new Trogon of the genus *Pharomacrus*, proposed to be called *P. xanthogaster*. Dr. Albert Günther read a description of a new species of Kangaroo from N.W. Australia proposed to be called *Halmaturus apicalis*. Mr. P. L. Sclater read a notice of some specimens of the Black Wolf of Tibet, now or lately living in the Society's Menagerie. Mr. H. E. Dresser exhibited Eggs of the various European species of *Hypolais*, together with those of *Acrocephalus streperus* and *Apalustris*, and pointed out that these two groups (*Hypolais* and *Acrocephalus*) approach each other in their eggs as well as in other characters, the two nearest allied in each group being *Hypolais rama* and *Acrocephalus palustris*. Mr. W. T. Blanford read a notice of two new Uromasticine Lizards from Mesopotamia and Southern Persia, proposed to be called *Uromastix microlepis* and *Centrotrachelus loricatus*. A second paper by Mr. Blanford contained descriptions of two new species of Ichneumon and of a Hare collected by Mr. F. Day in Sind, and new to the Indian Fauna. One of the former and the Hare were believed to be new to science and were called *Herpestes ferrugineus* and *Lepus dayanus*.

The next meeting of this society for scientific business, will be held at the Society's House, in Hanover Square, on Tuesday, the 1st of December, 1874, at half-past Eight o'clock p.m.

SYNTHETIC DIVISION IN ARITHMETIC.

By Edward David Hearn, M.A.,
Columbia College, New York.

In the June number of Scientific Review I suggested an extension of Horner's synthetic process for the division of algebraic quantities, and have since been entrusted by President Barnard, of Columbia, the editor-in-chief of the great American cyclopædia now publishing—"Johnson's New Universal Cyclopædia: a Scientific and Popular Treasury of Useful Knowledge"—with the articles bearing upon the subject, Horner's process, cubic equations, and Suffield's process, in referring to which De Morgan, in his "Budget of Paradoxes," says:—"These paradoxes of calculation sometimes appear as illustrations of the value of a new method. In 1863 Mr. G. Suffield, M.A., and Mr. J. R. Lunn, M.A., of Clare College and of St. John's College, Cambridge, published the whole quotient of 10000...... divided by 7699 throughout one of the recurring periods, having 7698 digits. This was done in illustration of Mr. Suffield's method of synthetic division."

Now, although more than ten years had elapsed since the discovery of the method, it appeared to be quite unknown in America, and I almost despaired of finding anyone who had even heard of it in this country; but in reply to an enquiry through the *Mining Journal*, a lady relative of the author, now dead, kindly furnished me with an explanation of the system, which will now be described in popular language, and so as to be intelligible to those who understand the first four rules of arithmetic only. We know that if we multiply the divisor and the quotient into each other the product will be equal to the dividend, and in certain cases we shall be able to observe the quotient itself occupying a place among the partial products obtained in the process of multiplication; thus, 305,963÷401=763, and multiplying the quotient by the divisor we have

$$\begin{array}{r} 763 \\ 401 \\ \hline 763^{*} \\ 305{,}200 \\ \hline 305{,}963 \end{array}$$

where the partial product marked * is the quotient itself, and the other partial product is 400 times greater than the quotient, so that if we can find a means of taking away 400 times the quotient from the product we shall have the true quotient. But as we do not know the true quotient, we cannot at once determine what figures will represent 400 times the true quotient; yet, as a sufficient portion of the larger partial product, is unaffected by the partial product obtained by the multiplication by the unit figure to enable us to find the first figure of the true quotient we can readily find the product of the true quotient multiplied by 400. Taking the dividend 305,963, we first divide the 30 by 4, which gives us 7 with a remainder (at present we only want the 7), and we know this 7 must be that resulting from the multiplication of the figure in the hundreds place of the true quotient by that in the units place of the divisor; if, therefore, we subtract this 7 from the figure in the hundreds place of the dividend, we shall obtain the fourth figure of the larger partial product; 7 from 9 leaves 2, and as the fifth and sixth figures must be ciphers, 305,200 must be equal to the true quotient multiplied by 400, and since by subtraction,

$$\begin{array}{r} 305{,}963 \\ 305{,}200 \\ \hline 763 \end{array}$$

it follows that 763 is the quotient resulting from the division of 305,963 by 401. This is synthetic division *subtractive*, and in practice is performed thus.

$$\begin{array}{r} 4)305\cdot963 \\ \hline 763 \end{array}$$

The mental process is this. We say 4 in 30=7 and 2 over; write 7 under 9; 4 in 25=6 and 1 over; write 6 under 6; 4 in (19−7) 12=3 and no remainder; 4 in 6−6=0; 4 in 3—3=0; therefore 763 is the exact quotient arising from the division of 305,963 by 401. To facilitate synthetic division in arithmetic it is desirable to have the divisor near 10, or some multiple of 10; yet the divisor must not be 10, nor any multiple nor aliquot part of 10. Suitable divisors are obtained by multiplying or dividing both dividend and divisor by one and the same number. Suppose, for example, we require to divide 1,419,564 by 234, we divide both dividend and divisor by 6, and then quickly obtain the true quotient by short synthetic division *additive*, thus,

$$\begin{array}{lr} 6)234 & 6)1419564 \\ \hline \quad 39=\text{Syn. D., } 4\cdot & 4)23659\cdot4 \\ & \hline 6066\cdot\dot{5}1282\dot{0} \end{array}$$

Here 6 is an ordinary divisor, and 4 a synthetic divisor. In the synthetic division the mental process is, 4 in 23=6 *minus* 1; write 6 under 6; 4 in (6+6—10, for the 1 must of course be carried as 10, because we are using it with figures one place lower in the scale of local value) 2=0 and carry 2; write 0 under 5; 4 in 25+0=6 and carry 1; 4 in 19+6=6 and carry 1. As we have now reached the decimal point in the dividend we must place the decimal point in the quotient. We continue 4 in 14+6; 4 in 0+5; 4 in 10+1; 4 in 30+2; 4 in 0+8; 4 in 0+2=0 and 2 over; and as this is a remainder which has occurred before we know that the period is completed, and that 1,419,564÷234 is equal to $6066{\cdot}\dot{5}1282\dot{0}$.

The rule is first to multiply or divide the divisor by a number that will bring it very near to a multiple of 10 (401 is already a suitable divisor and 234÷6=39); next add or subtract that figure which will make the partially converted divisor (401 or 39) a multiple of 10 (400 or 40), and having multiplied or divided the dividend by the figure used to manipulate the divisor, point of in the converted dividend as many decimal places commencing at the units place as there are ciphers in the converted divisor (400 or 40). Place the first figure of the quotient as many places from the beginning of the converted dividend as would be required for the first division by the synthetic divisor with the ciphers annexed (we must have 3059 to divide by 400; and 236 to divide by 40; we, therefore, place the first figure of the quotient under the 9 or four places, and under the 6 or three places from the beginning respectively). Divide, as in the ordinary process, but add in the quotient figure standing in vertical line, with the figure of the dividend which is being manipulated. The integer portion of the quotient will be complete when the decimal point in the dividend is reached.

The general principle of the process will now be readily understood; and likewise the reason of Mr. Suffield's rule. "To find Q, the quotient of A÷B. Let

$$a^{n-1},\ a^{n-2},\ \&c.,\ a^{1},\ a^{0}$$

be the digits in the *n* last places of B. Then if

$$9-a^{n-1},\ 9-a^{n-2},\ \&c.,\ 9-a^{1},\ 10-a^{0}$$

be added respectively to these digits; it will convert B. into a number with a significant part (which call the Synthetic Divisor) followed by *n* ciphers. Point off *n* places of decimals from the units place of A, and divide it by the synthetic divisor so as to find q the first figure of Q; then above or below each of the *n* places of the dividend which would in common division have to be brought down to find the next *n* figures of the quotient write

$$(9\ a^{n-1})q.\ \ (9-a^{n-2})q,\ \ \&c.,\ \ (9-a^{1})q,\ \ (10-a^{0})q$$

respectively, leaving room to the right hand of each multiple for the same multiple of all the other figures of the quotient when found."

If the *n* last digits of the divisor be each, 9, the general rule will be much simplified. There can be no doubt that Mr. Suffield's process is capable of very extensive application, and it is regrettable that it has not hitherto become more generally known. With very little practice synthetic division is quite as easy as ordinary division, and it is especially valuable because it abbreviates to an extraordinary degree calculations which, by the usual processes of division, are long and tedious.

As many may like to know something of the inventor of the process, it may be stated that Mr. Geo. Suffield, M.A., of the University of Cambridge, graduated from Caius College as a wrangler in 1842, and afterwards became a Fellow of Clare College and one of the University examiners. He was a man of varied accomplishments, of high ability, of almost primitive simplicity of life and manners, and noble integrity of character. He was much devoted to science, and whilst residing in his University engaged in researches which he never lived to accomplish. He was carried off by small-pox in 1870. De Morgan considered that he was "on the scent of investigations of great value;" and let us hope that others will complete the useful work which he was unable to finish.

SOME OTHER SCHOOL BOARD DOINGS.

As we see no hope that education will be speedily popularized unless the public elementary school authorities are made to understand (by bringing public opinion to bear on them) that zeal without discretion is worse than useless for that object, we publish the following extracts from the *Daily Telegraph* (25th and 26th Nov.):—

"An inquest was held yesterday at the Peacock Tavern, Cambridge Heath-road, Bethnal green, upon the body of Mary Ann Dowsett, 4, who had died under peculiar circumstances. The mother of the deceased deposed that her little girl, who, prior to the 19th October, was in good health, went together with her sister to a board school in Globe-street. On the afternoon of that day she came home much frightened, and stated that she had been placed in a cupboard in the schoolroom as a punishment. Since that time, and up to her death, she used to wake up in the night and exclaim, "Mother, they did put me in the cupboard and dragged me off the gallery." She expired on the 19th inst. Lillie West, a girl about fifteen, and a paid monitor of the school, who, it was alleged, had placed the deceased in the cupboard, gave an emphatic denial to the allegation. The girl was unruly, and she punished her by placing her on a form for about two minutes, together with other children who had also misbehaved themselves. After the children had been dismissed from school she saw the deceased and her sister crying, and the former stated that she had been frightened by a boy who had threatened to put her in the coal-cellar. Medical evidence showed that the cause of death was gastric fever, which would be aggravated by fright. Ultimately the jury returned a verdict 'That the death of the deceased was accelerated by fright, through being put in a cupboard at school, and that the monitor was too young to have the power of punishing children.'"

"At the Southampton Borough Bench yesterday Wm. Goffe, the school attendance officer, was charged with assaulting James Walter Dyson, aged six years, the son of the South-Western Company's district superintendent. The nurse said she was out with the children, one of whom was riding a donkey, when they were stopped by the officer and cross-examined by him as to whether they attended school, and on both servant and the children refusing to satisfy his curiosity, he took the complainant by the shoulders and shook him violently, much frightening him. The defendant was fined 20s. and costs.

SCIENCE GOSSIP.

The medals in the gift of the Royal Society for the present year have been awarded by the Council as follows:—The Copley Medal to Prof. Louis Pasteur, the Rumford Medal to Mr. J. N. Lockyer, a Royal Medal to Prof. W. C. Williamson, and another Royal Medal to Mr. H. C. Sorby.

Prof. Cameron has a new work in the press entitled, "A Manual of Public and Private Hygiene, for Officers of Health, Boards of Guardians, and Sanitarians Generally." The work will be issued by Messrs. Baillière, Tindall, and Cox.

It is understood that Mr. Beauchamp Tower, already known as the inventor of "Tower's Speed Indicator," has just completed, under the auspices of Sir William Armstrong's Company, a most successful series of experiments with an automatically propelled torpedo. Its range and speed are such as to justify the conclusions of those most qualified to judge that it may not only rival, but supersede the Whitehead Fish Torpedo.

In reply to a petition praying permission to erect a memorial to Jeremiah Horrocks within the walls of Westmister Abbey, the Dean and Chapter have signified their willingness to admit a tablet, and have reduced the fee ordinarily payable to the sum of £25. A subscription, in which it has been thought well to restrict the donations to the sums of one guinea and under, has been set on foot. Should there be any surplus, it has been proposed to appropriate it to the purchase of books, to be deposited in the library of the Royal Astronomical Society; or, if the surplus should be of sufficient amount, to invest it in the name of trustees upon trust, to apply the interest for the purchase of books or for the general purposes of the library. Among the subscribers are Prof. Adams, of Cambridge, Sir George Airy, the Baroness Burdett-Coutts, the Duke of Devonshire, Mr. E. Dunkin, Prof. J. H. Gladstone, Prof. Grant, Dr. Huggins, Lord Lindsay, the Bishop of Manchester, Prof. Pritchard, the Earl of Ross, and Prof. J. S. Smith.

At the Port Clarence works, belonging to the Messrs. Bell Brothers, an excellent deposit of salt has been found. The Diamond Boring Company has been engaged in boring for nearly a year, and their perseverance has at length been rewarded with the discovery of salt near Middlesbrough. The value of this to the chemical works of the Tees and the Tyne cannot be over-estimated.

It cannot be too generally known that many vessels which are sold as being tinned are really coated with a mixture of tin and lead. M. Fordos has addressed a paper to the Académie des Sciences, in which he states that water, acidulated with only 1 per cent. of acetic acid, being allowed to stand in such vessels dissolves out some of the lead. Therefore, such vessels are likely to prove injurious, and should be guarded against.

APPLICATIONS FOR LETTERS PATENT.

Continued from page 170.

On September 24th.—3260 to 3279.—C. P. Shrewsbury. Fly or taking-off apparatus for printing machines.—A. Davidson and B. Goldstein. Apparatus for obtaining motive power. —W. F. Thomas. Sewing machines.—A. H. Maclean. Apparatus for feeding wool, cotton, or other fibrous materials to carding or other machines.—W. McNaught, sen., J. McNaught, and W. McNaught, jun. Steam-engines.—S. Senier and E. Horwood. Apparatus employed for crimping, creasing, or folding woven fabrics, lace, leather, or other materials (com.)—D. de Lara and H. T. Sewell. Apparatus for preventing injury to vessels in collision at sea.—W. B. Pinhey. Rotatory engines.—J. B. Clark. Ships' anchors and appliances connected therewith, and ships' hawse holes for the same, and for other anchors.—R. P. Spice. Apparatus used in the manufacture of gas.—J. Simpson and S. T. Fawcett. Construction of perambulators, rendering them applicable to swings.—H. A. Bonneville. Apparatus for the application of wire coverings for securing the corks of bottles containing sparkling wines or other fermented or effervescent liquids (com.)—H. A. Bonneville. Machinery for corking bottles (com.) (Complete specification.)—H. A Bonneville. Jack (com.)—H. Bessemer. Apparatus for regulating or controlling the motion of suspended saloons, cabins, floors or platforms of steam or sailing vessels. (Complete specification.—W. Ladd and A. Hilger. Spectroscopes. —T. Kendall. Burial vaults and graves and means of burying the dead.—L. G. B. J. Masse and W. Webster. Apparatus for stamping and inking bonds, shares, bills, and other documents. —J. Crawford. Fenders and other articles ordinarily used in connection therewith.—H. L. Jones. Combined flushing and deodorizing and disinfecting apparatus for use in urinals, waterclosets, and similar purposes.

On September 25th.—3280 to 3297.—R. Elsdon. Construction of iron fences.—S. J. V. Day. Manufacture of gas and the means or apparatus employed therefor (com.)—W. Allan. Making metal founders' blacking.—W. Corbitt.—Cooking ranges. — T. H. Thompson. Marine governors.—J. Anderson and L. Banks. Window sashes and parts connected therewith.—W.

Thomas. Weaving barred and figured fabrics.—G. Furness. Construction of cocks and valves for controlling the flow of liquids and fluids.—R. R. Moffatt. Ordnance and projectiles.—R. Coddington. Telegraphy (com.) (Complete specification.)—R. Marriott. Construction of boilers for heating liquids and generating steam.—P. Jensen. Machine or appliances for folding and pressing trimmings, bindings, and other articles made of textile fabrics (com.)—W. Darlaston and W. Hawkins. Apparatus for the preventing or diminishing of smoke in steam boiler and other furnaces.—C. D. Abel. Break apparatus for the rolling stock of railways (com.)—R. Hornsby and J. Scott. Steam boiler furnaces, and apparatus connected therewith.—W. B. Espeut. Apparatus for evaporating saccharine and other solutions.—W. McNabb. Machinery for compressing various descriptions of merchandise into bales or packages, and also for other purposes where compressing, bending, or lifting is necessary.—A. Turner. Manufacture of elastic fabrics.

On September 26th.—3298 to 3309.—E. Entwistle. Suspenders or bearers for tubes, rods, wire, or other equivalents.—W. Walker. Rockdrilling machinery.—R. Kerr. Making up for sale or use sewing thread of cotton, linen, or silk.—J. B. Rogers. Catch and slip hooks applicable to boat lowering and other mechanism or purposes on board ship, vehicles, cranes, and other machines or apparatus.—T. Wright. Signalling on railways, and the machinery or apparatus employed therefor.—J. W. Harland. Handles for locks, latches, doors, and other articles to which knobs or handles are applied.—M. G. White. Self-acting apparatus for regulating the supply of water or other liquids.—B. Samuelson and W. G. Manwaring. Harvesting machines.—R. Berryman. Apparatus for circulating, heating, and purifying the feed water for steam-boilers, and the connections of or mode of attaching such apparatus to the said boilers.—T. B. Redwood. Manufacture of gas for burning.—W. Brownlie. Mode and means of exhibiting or giving publicity to trade-marks and advertisements.—A. Sézille. Bread making from bread stuffs without reducing them to flour by chemical decortication.

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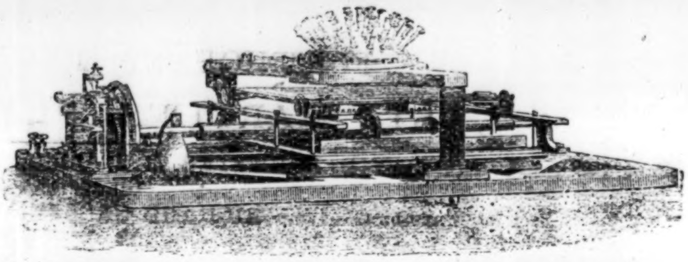

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